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The "WFD-effect" on upstream-downstream relations in international river basins – insights from the Rhine and the Elbe basins

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Abstract

The upstream-downstream relationship in international river basins is a traditional challenge in water management. Water use in upstream countries often has a negative impact on water use in downstream countries. This is most evident in the classical example of industrial pollution in upstream countries hindering drinking water production downstream.

The European Water Framework Directive (WFD) gives new impetus to the river basin approach and to international co-operation in European catchments. It aims at transforming a mainly water quality oriented management into a more integrated approach of ecosystem management.

After discussing the traditional upstream-downstream relationship, this article shows that the WFD has a balancing effect on upstream-downstream problems and that it enhances river basin solidarity in international basins. While it lifts the downstream countries to the same level as the upstream countries, it also leads to new duties for the downstream states. Following the ecosystem approach, measures taken by downstream countries become increasingly more important. For example, downstream countries need to take measures to allow for migrating fish species to reach upstream stretches of river systems. With the WFD, fish populations receive increased attention, as they are an important indicator for the ecological status. The European Commission acquires a new role of inspection and control in river basin management, which finally also leads to enhanced cooperation and solidarity among the states in a basin.

In order to achieve better water quality and to mitigate upstream-downstream problems, also economic instruments can be applied and the WFD does not exclude the possibility of making use of financial compensations, if at the same time the polluter pays principle is taken into account.

The results presented in this article originate from a broader study on integrated water resources management conducted at Bonn University and refer to the Rhine and Elbe basins (Moellenkamp, 2006).

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1 Introduction

1.1 Upstream-downstream relationships in a changing environment

Upstream-downstream relations are a traditional challenge in international river basin management. In the classical upstream-downstream relationship, represented as a unidirectional externality, the upstream country profits from the water resource whereas the downstream country suffers from pollution and thus restricted water use. Since the year 2000, the Water Framework Directive (WFD) introduces new background conditions for water management in the European Union, which also influence the upstream-downstream relationships in international basins. The article at hand focuses on the effects of the WFD on the upstream-downstream relations in the Rhine and Elbe basins. Does the WFD assign new roles to upstream and downstream countries? Is there a new role for the European Commission in river basin management? In how far does the ecosystems approach influence the upstream-downstream setting in international basins? And are compensation payments still possible?

In the following paragraphs, a brief background is given on theoretical aspects of upstream-downstream relationships, the study area and approach. Section 2 discusses the situation prior to the WFD implementation, and especially focuses on the role of downstream countries for river basin co-operation as well as the instrument of financial transfers between basin states. Section 3 deals with the effects of the WFD on upstream-downstream relations, taking into account the role of the downstream country, a new role for the European Commission, the hydro-political consequences of the ecosystems approach and the question of financial compensation. Section 4 presents the general conclusions.

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1.2 Upstream-downstream relations in river basin management – a theoretical overview

While river basins can be considered as an entity in hydrological terms, for the most part their boundaries do not coincide with the political boundaries of nation states or regions. The mismatch between hydrological and political-administrative boundaries is particularly apparent in international river basins, where river basin boundaries cross administrative boundaries. This mismatch of different spatial scales is often referred to as "spatial misfit" (Young, 2002).

In international basins, it becomes obvious that the possible use and profit of the water as well as its impacts on the water use by other basin states depend on the geopolitical location of a state in the basin. The situation is characterised by an asymmetric setting. Different authors have shown that asymmetric upstream-downstream externality problems are more difficult to solve than common pool resources problems (Ostrom, 1990) that affect all parties similarly, such as air pollution (Bernauer, 2002; see also Dombrowsky, 2007a).

In the classical setting of upstream-downstream relations, especially concerning questions of water quality, water use of the downstream country is dependent on the upstream country. In particular this is the case if interests vary, for example in constellations with emissions upstream and drinking water use downstream. In this case, water use in upstream countries leads to negative effects in downstream countries. Water use and water harm belong to different spatial entities and generate "one-sided international externalities" (Durth, 1996).

In her theoretical article about benefit-sharing in transboundary rivers, Dombrowsky points out that depending on the water use, these externalities do not only have to be negative but can also be positive (Dombrowsky, 2007b). A measure taken upstream can be positive for the downstream party, such as for example the construction of a flood detention area or it can have negative effects such as polluted water. As stated above, externalities in the use of water – positive or negative – have a unidirectional

character (Rogers, 1993; also see Barrett, 1994) and most of the external effects are directed downstream.

In case of some uses, the direction of the relationship between the upstream and the downstream country is in the inverse; that is, the downstream party has more control than the upstream party. For example, in navigation, the downstream party often has a better position than the upstream party due to the importance of the connection to the sea or to the hydrological situation favouring navigation. In this case, development of port facilities downstream may benefit upstream countries, thus meaning a positive externality directed upstream (Barrett, 1994). Dombrowsky gives a detailed economic and theoretical analysis of different typologies of international water management problems, also distinguishing the alignment of the hydrological and political boundaries and the resulting effects.

In the following, the focus is on the upstream-downstream relationship and therefore on transboundary rivers. Border rivers are not taken into account separately. The discussion focuses exclusively on blue water, as this is the most important aspect for upstream-downstream relationships in the Rhine and the Elbe basins related to the WFD. Green water flows (Falkenmark, 2000), which are of special importance for upstream-downstream relations in water scarce areas, will not be discussed.

1.3 Study areas: the Rhine and the Elbe basins

The Rhine and the Elbe basins lie within the heart of the European Union. The majority of their catchments lie within Germany, and they are among the most important river basins for that country. Both are transboundary rivers and flow into the North Sea.

The Rhine basin extends over 185 000 km^2 and encompasses nine states: Germany, Switzerland, the Netherlands, France, Belgium, Luxemburg, Austria, Liechtenstein and Italy (see Fig. 2). 70 Mio. people live within the catchment area. Regarding their economic settings, the states in the Rhine basin are located on rather equal level and most of them have a long history within the European Union. Switzerland, despite not being a member of the European Union, is nevertheless on equal lines concerning

economic aspects. The Rhine is used for multiple purposes; it is one of the most frequented water ways of the world and provides 20 Mio. people with drinking water (Hofius, 1996; Koordinierungskomittee Rhein, 2004).

The Elbe basin has a catchment area of 148 268 km^2 and is shared by four states: Germany, the Czech Republic, Austria and Poland; with the latter two encompassing less than 1% of the catchment (see Fig. 3). About 25 Mio. people live within the catchment area (FGG Elbe, 2004). During the Cold War, the Elbe symbolised the separation between the two German states as well as the separation of the whole European continent (Holtrup, 1999). Cooperation among the basin states only became possible after the fall of the Iron Curtain and had to cope with high discrepancies between the economic settings of the basin states. With the accession of the Czech Republic to the European Union in May 2004, a common and broad frame was set, making cooperation a fundamental part of water management and improving the economic situation in Eastern Europe, though equal economic levels have not yet been reached within the basin.

The different geopolitical settings in the two basins result in a very clear upstream-downstream relationship for the Elbe basin, with the Czech Republic as the upstream and Germany as the downstream partner. A more complex setting is found in the Rhine basin, with Switzerland and France as the main upstream partners, Germany in a middle position and the Netherlands as the downstream partner. Germany thus holds differing positions in the two basins, which makes it an interesting country to focus on.

1.4 Study approach

Apart from document study, an empirical approach was chosen to investigate the development of the upstream-downstream situation in the Rhine and Elbe basins. To this aim, methods from qualitative social research were applied.

Several expert interviews were conducted with water managers and selected water users from different administrative levels in both basins. The minutes of each interview were validated by the interviewee and evaluated anonymously. The questions on

upstream-downstream relations were embedded in a broader frame, also investigating other aspects of integrated water resources management. Apart from the expert interviews, observational studies were conducted in order to complement and validate insights from interviews, and vice versa.

2 Mitigating upstream-downstream problems – co-operation prior to the WFD

The aforementioned shows that the countries in an international river basin are interdependent. This means that they are potentially better off if they cooperate in managing the international water resource. In practice such co-operation is typically codified in international agreements (Barrett, 1994), which is also the case for the Rhine and Elbe basins.

2.1 Co-operation structures in the international Rhine and Elbe basins

Co-operation of the basin states has a long tradition along the Rhine, where the International Commission for the Protection of the Rhine (ICPR) was permanently established in 1963, following the signature of the Berne Convention. During the first decades, the ICPR member states tried to improve water quality by negotiating international agreements concerning chlorides and chemical pollution. Since the mid-1980s, the ICPR has turned to working with non-binding action programs as their main instrument. The work of the ICPR was evaluated as very successful (for example Gurtner-Zimmermann, 1998; Holtrup, 1999; Dieperink, 2000). Being the goal of the Rhine action program for the year 2000 (ICPR, 1991), the return of the salmon into the river system was one of the most visible outcomes of the co-operation. The ICPR has served as a model for the development of further river basin commissions, such as the International Commission for the Protection of the Elbe (ICPE), established immediately after the fall of the Iron Curtain in 1990. The ICPE has similar structures as the ICPR and has been able to make use of ICPR's previous experiences. For example, it was immediately structured

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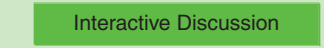

to encompass nearly the entire catchment area of the Elbe, instead of just the river stretch, as was the case for the early Rhine regime (for more information on the Elbe regime, its "institutional design and regime effectiveness", see Dombrowsky, 2007c, in this Special Issue).

After the river basin commissions in the Rhine and Elbe had been established, they first tackled the persisting water quality problems that were mainly due to urban and industrial waste water.

Mitigating water quality problems in the classical upstream-downstream setting means applying new technical measures for water treatment. Doing so in the upstream country has the consequence that the downstream country profits from these measures, while the "economically" optimal water use in upstream countries is disturbed (also see Durth, 1996). This is the reason why downstream countries are of utmost importance for the co-operation in international basins: they are very motivated to improve water quality. Downstream parties would profit from any treatment measure taken upstream. Here, compensation payments from the downstream to the upstream party are a possible instrument to mitigate upstream-downstream problems, and possibly to accelerate upstream action.

2.2 Importance of downstream countries for co-operation

While downstream countries often have the role of promoting co-operation in international basins, the other countries of the basin might perceive them as a "demanding victim" and "profiteur" of the measures for water protection.

In the Rhine and Elbe basins, the downstream countries have always been very proactive in engaging in co-operation on water quality management (for the Rhine see also Dieperink, 2000). Several decades ago, the Netherlands began to argue against Chloride pollution in the Rhine. This led to several years of bargaining, which resulted in an international treaty on Chloride pollution. In the Elbe basin, the downstream German Land Hamburg engaged after 1990 with the Czech Republic to support the use of new technologies for water treatment in industrial plants, in order to decrease

pollution of the aquatic sediments (Moellenkamp, 2006). In general, downstream countries taking the initiative for improving water quality were often an important impetus for international river basin co-operation.

It should be mentioned that countries in an international river basin are not only linked by the joint water resource, but by numerous other international relations. Such links can also be the reason why an upstream country takes measures: it may seek to improve friendly neighbourhood relations (Barrett, 1994). This has also been shown by Durth, with his principal hypothesis that upstream-downstream asymmetries are easier to solve when riparian countries are more integrated and the density of political, economic, and societal ties among countries is greater (Durth, 1996, analysed in Bernauer, 2002). This is also observable in the Rhine and Elbe basins. The countries of the Rhine basin are in the heart of European integration and thus strongly intertwined, and Switzerland, despite not being an EU member state, does not disturb this constellation. In the Elbe basin, co-operation on water resources only became possible after 1989, when the fall of the Iron Curtain set the scene for new possibilities of co-operation.

2.3 Transboundary financial compensations

One of the possible instruments used to mitigate upstream-downstream problems is trans-boundary financial compensation. In the classical upstream-downstream situation, these are directed from the downstream to the upstream party, compensating the latter for its investments, for example in waste water treatment technology. In such a case, compensation payments are paid by the party that profits from the treatment measure, not by the party responsible for the pollution.

A prominent example of compensation payments in a more complex sense is the agreement concerning compensation to mitigate salt pollution in the Rhine in the 1970s. Salt pollution resulted from a wellknown point source in France – a potassium mine in the Alsace – as well as from several other sources in the basin. As the most downstream partner, the Netherlands suffered most from the salt pollution and initiated

a bargaining process between the countries of the basin. A solution was found many years later: in order to diminish the maximum possible amounts, the riparian states decided to concentrate their joint efforts on the potassium mine in France, a point source pollution, where measures were most cost-effective. The costs to diminish the salt pollution of that mine were shared between the basin states, reflecting the proportion of salt pollution of each single country (Moellenkamp, 2001). Despite various difficulties during its negotiation and implementation, the Rhine Chloride Convention is important as it serves as an example for sharing the costs of pollution control among riparians (Barrett, 1994).

Another instrument to overcome upstream-downstream conflicts is the linkage of uses controlled by downstream parties with uses controlled by upstream parties (Dombrowsky, 2007a). Dombrowsky shows the theoretical possibility of issue linkage in a river basin when possible compensations from upstream to downstream and vice versa are the same. For instance, compensation payments from a downstream country to reduce pollution in an upstream country could cover the amount of possible compensation payments of an upstream country to the downstream party in order to compensate for its building a fish ladder.

While compensation payments are an important instrument for river basin cooperation, they are not in use in most of the co-operative actions taken by either the ICPR or the ICPE. Many of the actions within the international commissions for the protection of the Rhine and the Elbe were taken on the basis of voluntary agreements and action plans, without explicit compensation, but still compensation was a possible instrument.

3 The water framework directive and upstream-downstream relations

3.1 The water framework directive – a new approach for European water management

Prior to the year 2000, European policies dealing with water resources focused on setting water quality standards or on controlling emission levels, such as the directives on urban wastewater (Council Directive 91/271/EEC) or on integrated pollution prevention and control (Council Directive 96/61/EC). Other directives were designed to protect specific endangered species such as the birds directive (Council Directive 79/409/EEC).

Since 2000, the European Water Framework Directive (Directive 2000/60/EC) provides an umbrella for European water policy, replacing some of the older directives and bringing others into a broader context. The overall aim of the WFD is to achieve a "good status" of surface and ground water by the year 2015. It takes into account the chemical and ecological status of the river, but also leaves open different possibilities for exceptions from reaching that status. Altogether, it pursues a more holistic and integrative view, in which an ecosystem approach is emphasised, shifting away from a strong focus on water quality problems.

Furthermore, the WFD requires a river basin approach, obligating the EU Member States to define river basin districts (Art. 3 WFD) where water management has to take place. The Rhine and the Elbe were defined as such international river basin districts. In some river basin districts, existing co-operation structures were expanded; in others, new ones were created in order to include all states of the basin. While the WFD leaves the concrete decision on co-operation structures up to the Member States, it has promoted the development of new structures among the states of a river basin. Herewith, it has also brought about changes in the upstream-downstream relationship of riparian states.

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3.2 Organizational implementation of the WFD in the Rhine and Elbe basins

The international agreements for the protection of the Rhine and the Elbe were "incomplete" (also see Barrett, 1994) in the sense that the number of parties to the treaties was less than the number of countries in the river basins. The ICPE already focused on the whole river basin, including the European Union as a contracting party, but had to further include Poland and Austria into its activities. In the Rhine basin, the ICPR only encompassed Switzerland, France, Germany, Luxemburg and the Netherlands as well as the European Union. The other countries of the basin such as Belgium or Austria were not members and had to be included in the management in order to comply with the WFD requirements. In the Rhine, the water managers opted at first for the development of new co-operation structures which partly doubled the structures of the ICPR. Only recently, water managers aim at merging these structures (see Moellenkamp, 2006). Another new development in both basins is the definition of sub-catchment areas for the operational work (see Figs. 2 and 3). These allow for closer cooperation on concrete measures and enhance interaction at the regional level.

3.3 Effects of the WFD on upstream-downstream relations

3.3.1 New roles and duties for downstream countries: co-operation on equal levels

Most of the water managers interviewed in the Rhine and Elbe basins came to the conclusion that the WFD leads to an improvement of upstream-downstream relations in the basins.

In this respect, the WFD leads to a change in the roles of the countries in a basin: while traditionally the downstream country used to be the motor of the co-operation, the relations in the basin now become more equal. The WFD strengthens the position of the downstream country (see Holzwarth and Bosenius, 2002) and lifts it onto the same level as the other basin states. The WFD thus also strengthens the feeling of belonging to a community and the need to work on common problems. Former upstream-

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downstream problems are now more easily transformed into collective problems that need to be solved together by all countries of the basin (also see Durth, 1996). The states of the basin today feel a certain "joint responsibility" for the implementation of the WFD.

At the same time, downstream parties have the same tasks and duties in river basin management as upstream countries. This also concerns transparency of monitoring data which must be reported to the European Commission. Today, all countries of the basin must take measures to protect the water resources, and make these measures and monitoring data transparent.

3.3.2 Strengthened river basin solidarity and new external control

Apart from strengthening the downstream country, a new role is taken over by the European Commission. While the Commission was already a signatory to the Rhine and Elbe conventions, it now additionally takes over the role of control and inspection.

Though direct co-operation with the EU-Commission is generally considered as good by the states in the Rhine and Elbe basins, "Brussels" is now being perceived as the common opponent by all states of the basin (see Moellenkamp, 2006). With the WFD, the European Commission has become a new and higher level instance for river basin management. The EU-Commission, rather than the downstream country, can now be "blamed" for the need of investments, such as in new treatment technologies.

Together with cooperation on equal level, this external control leads to enhanced river basin solidarity among the states of an international basin. This solidarity is also linked to general European integration, as EU Member States interact on nearly all aspects. The integration in river basins must thus be seen against the background of more general international relations (also see Barrett, 1994).

Furthermore, the WFD encourages a common perception and interpretation of water management questions. Besides the binding directive, numerous informal guidance documents have been issued by the EU Member States together with the European Commission, giving a common ground for the interpretation and implementation of the

WFD.

The WFD gives impetus to the basin states to tackle problems on a common ground and to jointly search for solutions. Durth even states that in the Rhine basin, problems of upstream-downstream nature have already been changed into public goods issues before WFD implementation (Durth, 1996). It can be confirmed here that the WFD reinforces and institutionalises this development.

Co-operation in the basins of the Rhine and the Elbe has been ongoing for several years now and an atmosphere of trust has been established. Despite the younger history of co-operation in the Elbe basin, a German interview partner judges the current co-operation as being better than the one in the Rhine.

3.3.3 The ecosystem approach of the WFD – does it cause new upstream-downstream dichotomies?

Aiming at pursuing a holistic management, the WFD follows an ecosystem approach. Its focus goes far beyond a good chemical water quality, and aims at achieving a good ecological status of the water bodies. This means that not only emissions need to be reduced, but also ecosystems have to be restored – throughout the basin. Aquatic organisms should be able to migrate within a river system. This especially requires that downstream countries take specific action. For example, downstream weirs need to be passable for fish, often revealing a need to build fish ladders or other facilities in order to enable organisms to surmount obstacles. Here, the traditional and water quality related upstream-downstream relations are reversed: the downstream country has to take measures in order not to hinder fish from migrating upstream, as fish species are important indicators for a good ecological status according to the WFD. This does not only involve measures linked to hydromorphology, but also water pollution of the downstream country should not cause indirect barriers for migrating fish species (Moellenkamp, 2006).

Fish migration was already an issue in the Rhine and Elbe basins before the WFD came into force. Both international commissions had elaborated programs to reintro-

duce migrating species such as salmon (Moellenkamp, 2006). But today, the formerly non-binding goals have in part become new ecological requirements under the WFD. Fish population is one of the important indicators for a good ecological status, giving efforts to its restoration a higher priority on the agenda of water managers.

The ecological approach of the WFD thus also leads to a change in the hydropolitical constellation in the basin. The requirements for ecological restoration can reverse the traditional upstream-downstream situation and may lead to new dependencies on downstream countries, stressing the external effects directed upstream. In practice, this development will possibly not result in new upstream-downstream dichotomies, but rather be covered by the increasing river basin solidarity discussed in Sects. 3.3.1 and 3.3.2.

3.3.4 Financial compensation versus polluter pays principle?

As stated above, financial compensation is a possible instrument to overcome upstream-downstream problems. In the example of the Chloride Convention in the Rhine basin, mentioned in Sect. 2.3, the financial burden of abating a pollution problem was shared among different states in the basin. Today, the WFD brings in a new institutional framework, emphasising among others, the polluter pays principle (Preamble No. 38 and Art. 9 WFD). Financial compensations in the past are often said to be inconsistent with this principle. Measures for pollution abatement were not financed by the polluter, but by the parties who profited from better water quality, or from both parties as in the example of the Rhine basin stated earlier.

The question today is whether financial compensation is still possible under the WFD or not. In fact it is possible, if the polluter pays principle is respected at the same time. This can be done if compensation is only the second step after the polluter pays principle had been applied, for example by installing the best available technique. Compensation payments can then be used to finance the most cost effective reduction of the remaining pollution, if the water body is not yet in good condition (also see Moellenkamp, 2006). Another application could be to combat dangerous wastes from

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the past, for which the polluter is no longer traceable.

At the same time, it has to be considered that besides compensation payments other instruments to reduce or neutralize existing asymmetries are more easily employed. This is the case with issue linkages, which are often employed between "integrated countries", while compensation seems to be a prerequisite for cooperation in non-integrated settings (also see Bernauer, 2002).

The experts interviewed for the study had diverging opinions on the future application of financial compensations. Whereas an interviewee from the German Land level points out that these will no longer be necessary, since the integration of basin states will become even stronger than today, an interviewee from river basin level has the opinion that financial compensation will be used even more than in the past, for example in order to jointly finance measures in a basin. The interviewee sees the possibility that states open up to finance measures in a basin beyond their national boundaries. These would of course require a strong political will from the member states.

According to Moss, it is of utmost importance for the implementation of the WFD in Germany to find mechanisms to share costs in an equitable and efficient way among the states of a river basin (Moss, 2003). Basin-wide financial instruments can also be thought of in the sphere of flood protection. In this context, a German interview partner mentions that currently financial compensation between German Länder is being discussed between upstream and downstream Länder. On international level this option is not yet an issue but could be integrated in future river basin management plans.

4 Conclusion

Co-operation in the Rhine and the Elbe basins has a long tradition and has for a long time been based on international commissions. Upstream-downstream problems have already been diminished by such co-operation in an integrated environment.

With the WFD, new background conditions for water resources management emerge which will most probably further reduce upstream-downstream problems.

Co-operation in international river basins is enhanced and leads to the development of a river basin solidarity. Downstream countries are lifted to an equal level with the other countries in the basin and now have the same rights and duties as upstream countries. The European Commission has taken over an additional role as an instance of control and inspection in river basin management. The WFD has thus given impetus to the basin states to tackle problems on a common ground and to jointly search for solutions.

While traditional water management has for a long time focused on water quality management, it now shifts towards more integrated approaches, taking ecological aspects into serious account. In this respect, traditional upstream-downstream relations can invert, for example if fishes are hindered from migrating upstream by the downstream country, which in turn would impede the full implementation of the WFD in the upstream country. In practice, this would possibly not result in new dichotomies among the basin states, which have developed a joined understanding of water management problems.

In order to overcome any prevailing upstream-downstream dichotomies, financial compensations are still a possible instrument, if at the same time the polluter pays principle is taken into account. For future river basin management, questions such as basin wide financial mechanisms, resulting in more cost-effective measures – independent of upstream-downstream positions – should be taken into consideration.

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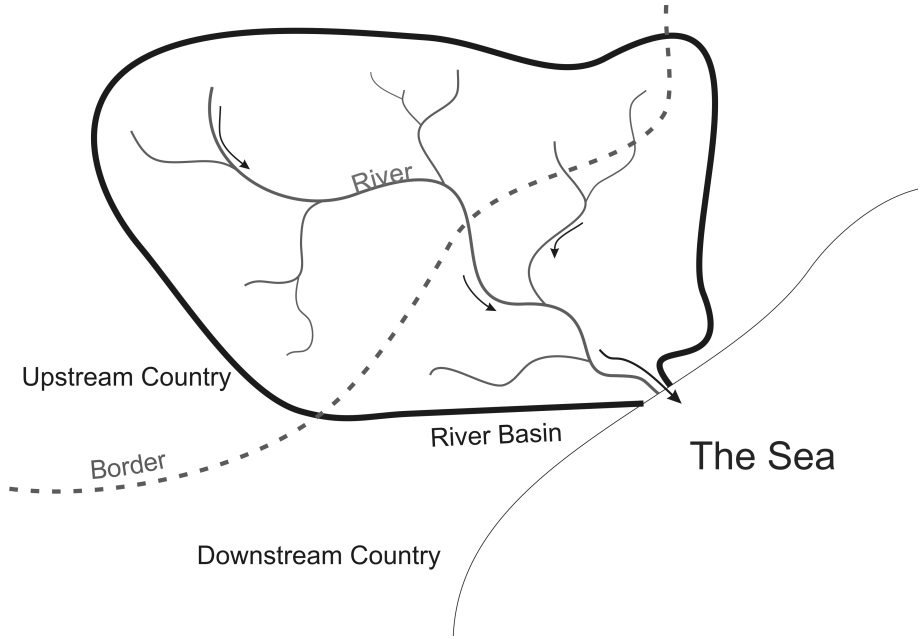

Fig. 1. Schematic upstream-downstream relationship in a river basin (Source: own presentation).

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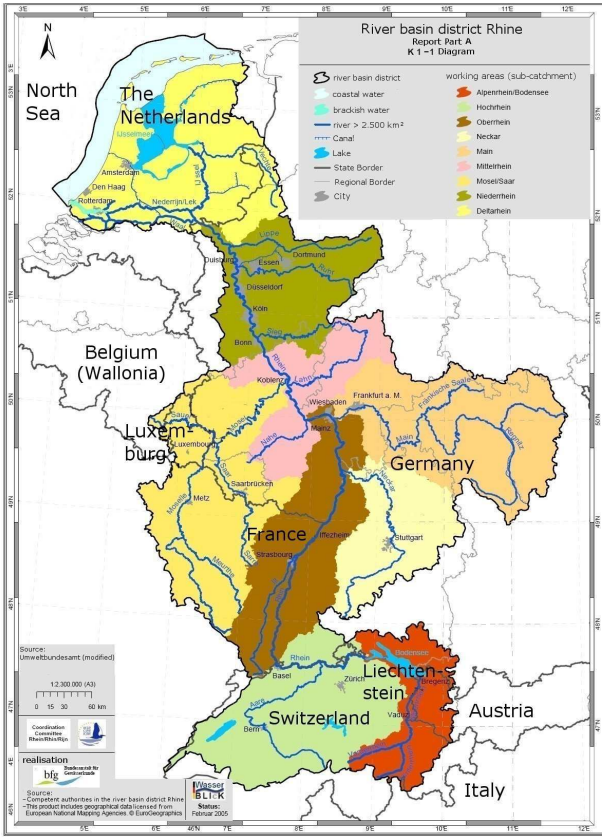

Fig. 2. The Rhine basin (Source: Umweltbundesamt (modified)).

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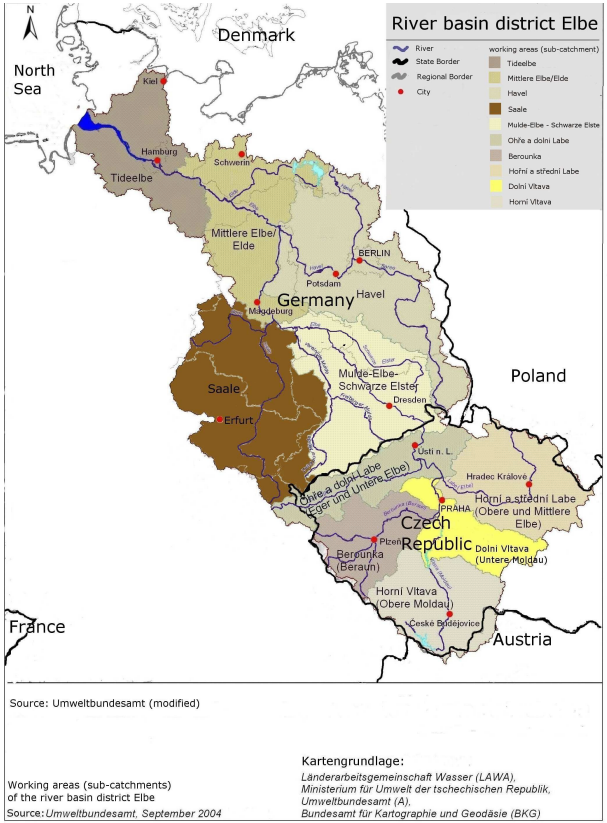

Fig. 3. The Elbe basin (Source: Umweltbundesamt (modified)).

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